

Model Evaluation Overview

Groundwater Modeling Group Working Group (GWMWG) Meeting

September 27, 2021

DRAFT 09/20/2021



SIGMA PI
ASSOCIATES, INC.

Presentation Context

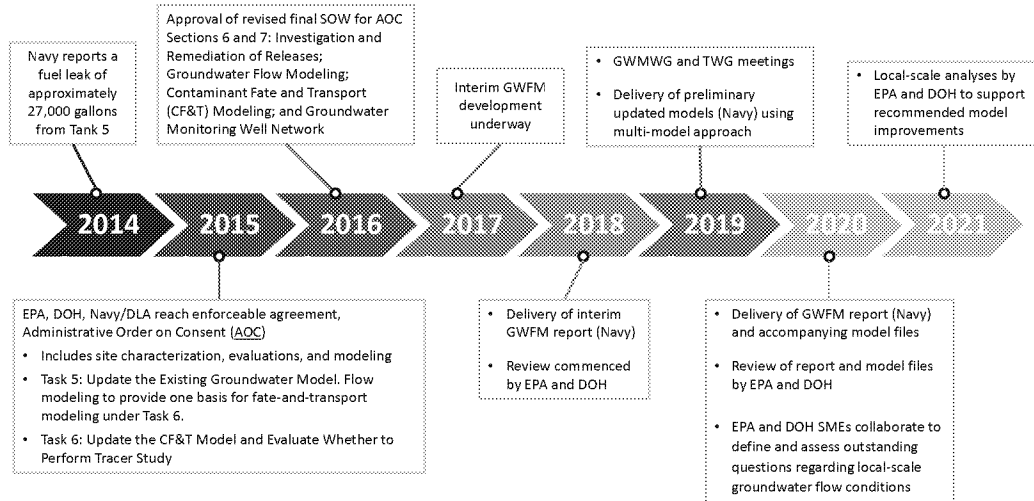
- The Navy submitted the Groundwater Flow Model Report in March 2020
- The Regulatory Agencies are working to determine the best path forward given the AOC schedule and the need for additional model refinements.
- In the interim, the Regulatory Agencies SMEs are using this opportunity to present and discuss some of their comments and concerns from their review of the Groundwater Flow Model Report and accompanying model files.



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Project Overview and Timeline



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Summary of EPA/DOH Review of GWFMR and Files

- Knowledge of the subsurface has advanced considerably since the execution of the AOC. Still, the GWFMs are not ready to support decision making and planning:
 - Conditions and patterns close to RHBSF are not accurately reproduced
 - No single model incorporates all potentially important features, events, and processes
 - Correspondence between models and data must improve to produce “behavioral” models for capture and transport analysis
 - Lessons learned require further analysis, discussion, and integration
- For example: the Navy’s TUA proposal states that modeling demonstrates that RHS can capture water beneath RHBSF if pumped at a rate of 5-10 MGD:
 - Though the current models may provide insights into regional conditions, they are not ready to represent transport and risk at RHBSF
 - Limited, local-scale analysis may help understand conditions to “feed back” to the Navy models



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Summary of EPA/DOH Review of GWFMR and Files

- Below are primary concerns that the Regulators share regarding (a) the CSM and (b) the GWFMs, that should be the focus of the next iteration of work:
 - Extent, role, and representation, of saprolites (*item 2 of "Top Ten Regulatory Concerns"*). Work has been performed on this but a best-estimate extent and configuration of saprolite features has not been determined, and their representation in the models may not reflect their actual role on migration.
 - Role of heterogeneity and preferential pathways on mixing, transport, fate, and capture (*items 4 and 5 of "Top Ten Regulatory Concerns"*).
 - Calibration to groundwater head differences (gradients), absolute heads (*item 6 of "Top Ten Regulatory Concerns"*), and transient head responses.
 - Correspondence between simulated flow patterns and groundwater chemistry data (*item 9 of "Top Ten Regulatory Concerns"*).
- Resolving these concerns is challenged by monitoring data sparsity and conflicts between observed chemistry and (presumed) groundwater flow rates and directions.

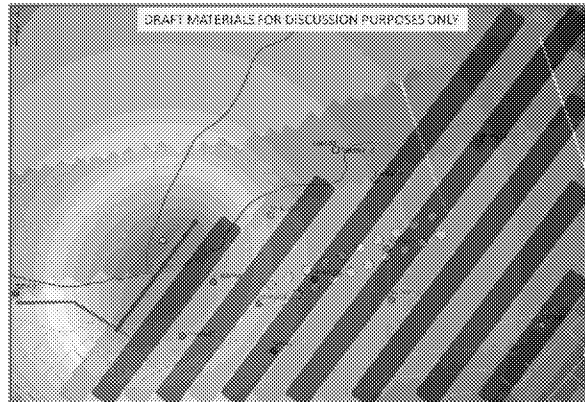


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Example: Representation of Subsurface Heterogeneity

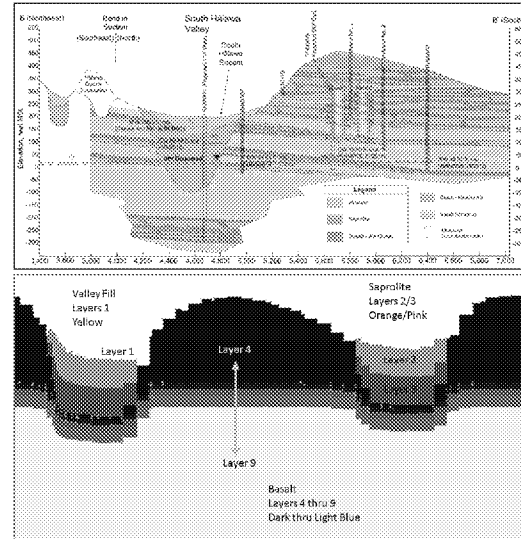
- There is abundant evidence for hydraulic property contrasts in basalt. The Navy represents this with an EPM, directional anisotropy plus (for some models) pilot points.
- Alternative methods for representing basalt-character heterogeneity should be considered that provide more realistic parameter fields.



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Example: Model Layering

- Use of topography- and structure-following approach may have some unintended consequences.
- Evaluate alternate methods to represent transitions between HSUs.



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Next Steps

- Determine specific technical GW modeling objectives for CSM and GWFMs:
 - Initiate AOC party SME “small group” meetings to address specific objectives.
- [*In small group meetings*] Determine areas of Navy / regulator SME concurrence and dissent on CSM / GWFMs:
 - Prioritize areas of disagreement to consolidation and meeting modeling objectives.
- Identify qualitative and quantitative model acceptance criteria
- Presuming successful model consolidation: identify method(s) for evaluating and communicating parameter and prediction sensitivity and uncertainty.
- Undertake technical modeling tasks laid out in small group meetings:
 - Consolidate groundwater models accordingly.
 - Conduct model simulations and evaluations.
 - Undertake uncertainty analysis.
 - Produce results and recommendations.



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Technical Presentation Overview

- On Day 2, a technical presentation will be provided to illustrate one approach to evaluating certain features of the local-area CSM.
- Although the work that will be presented uses modeling techniques, it is not a replacement for Navy model, rather a collaborative effort by the regulator SMEs to evaluate certain challenging aspects of the local groundwater system.



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